

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated:

1. (currently amended) An apparatus for positioning of an object in at least one plane comprising:

a holding member configured to hold the object to be positioned; and

a ~~first axis positioning system, wherein the first positioning system comprises~~ including a first set of flexure linkages linkage coupled to the holding member, wherein the first set of flexure linkages is configured to constrain movement of the holding member to a substantially linear motion along a first axis; and defining a first joint thereat, with said first joint being coupled to a second joint through a plurality of elongated members and a flexure joint, with said plurality of elongated members being coupled to said flexure joint to move at substantially the same rate and in opposite directions to facilitate movement of said holding member along first and second axes, with the first axis extending transversely to the second axis,

~~a second axis positioning system, wherein the second positioning system comprises a second set of flexure linkages coupled to the holding member, wherein the second set of flexure linkages is configured to constrain movement of the holding member to a substantially linear motion along a second axis.~~

2. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets of flexure linkages comprise a~~ wherein said plurality of elongated members consists of a pair of elongated members.

3. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets of flexure linkages comprise a~~ wherein each of said plurality of elongated members, and

3 ~~wherein two or more elongated members are flexibly coupled to form each linkage is~~
4 subjected to a pre-load.

4. (cancelled)

1 5. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a~~ wherein said plurality of elongated members and flexible
3 ~~joints coupling the elongated members together, and wherein each of said flexible joints~~
4 ~~is configured~~ consists of a pair of elongated members coupled to said flexure contact
5 joint to allow rotation of the between said pair of elongated members through at least a
6 degree predetermined range of motion.

1 6. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a~~ wherein said plurality of elongated members and flexible
3 ~~joints coupling the elongated members together, and wherein each of said flexible joints~~
4 ~~is configured~~ consists of a pair of elongated members coupled to said flexure joint to
5 allow rotation of the between said pair of elongated members through at least a 40 degree
6 range of motion.

7. (cancelled)

1 8. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a plurality of elongated members and flexible joints~~
3 ~~coupling the elongated members together, and wherein at least one of the flexible joints~~
4 ~~further comprises a rolling contact joint~~ wherein said positioning system further includes
5 an additional linkage having an additional plurality of elongated members and an
6 additional flexure joint with an additional plurality of elongated members coupled to said
7 additional flexure joint to move at substantially the same rate in opposite directions.

9. (cancelled)

10. (cancelled)

1 11. (original) The apparatus of claim 1, further comprising at least one motive device
2 coupled to the holding member.

1 12. (original) The apparatus of claim 1, further comprising at least one motive device
2 coupled to the holding member, wherein each motive device comprises a magnetic linear
3 servomotor.

1 13. (original) The apparatus of claim 1, wherein the holding member comprises a
2 wafer chuck.

1 14. (original) The apparatus of claim 1, wherein the holding member is configured to
2 hold a semiconductor substrate.

1 15. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets~~
2 ~~of flexure linkages each comprise at least two symmetrical flexure linkages wherein each~~
3 ~~of the elongated members of said plurality of elongated members has a common length.~~

1 16. (currently amended) The apparatus of claim 1, ~~wherein the first and second sets~~
2 ~~of flexure linkages each comprise at least two symmetrical flexure linkages, and wherein~~
3 ~~the apparatus wherein said linkage is configured to avoid minimize~~ kinematic
4 singularities.

17. Claims 17-30 (cancelled)

1 31. (currently amended) An apparatus for positioning of an object along a first axis
2 and a second axis comprising:

3 a holding member configured to hold the object to be positioned;

4 a platform coupled to the holding member;

5 a first set of flexure linkages coupled to the ~~holding member and the platform,~~
6 defining a plurality of first joints thereat, with each of said first joints being coupled to a
7 second joint through a first pair of elongated members and a first flexure joint so as to
8 facilitate movement of said first pair of elongated members in opposing directions while
9 facilitating movement of said platform along a first axis;

10 a second set of flexure linkages coupled to the platform, said second set of flexure
11 linkages defining a plurality of third joints thereat, with each of said third joints being
12 coupled to a fourth joint through a second pair of elongated members and a second
13 flexure joint so as to facilitate movement of said second pair of elongated members in
14 opposing directions while facilitating movement of said platform along a second axis;

15 a first motive device coupled to the holding member, wherein the first motive
16 device is configured to move the holding member in relation to the platform along ~~[[a]]~~
17 said first axis; and

18 a second motive device coupled to the platform, wherein the second motive
19 device is configured to move the platform along ~~[[a]]~~ said second axis;

20 ~~— wherein the first set of flexure linkages constrains the motion of the~~
21 ~~holding member substantially to a single plane along the first axis; and~~

22 ~~— wherein the second set of flexure linkages constrains the motion of the~~
23 ~~platform to a single plane along the second axis.~~

1 32. (currently amended) The apparatus of claim 31, ~~wherein the first set of flexure~~
2 ~~linkages comprises at least two opposed symmetrical linkages~~ wherein said first pair of

3 elongated members has a first common length and said second pair of elongated
4 members has a second common length.

33. (cancelled)

34. (cancelled)

1 35. (currently amended) The apparatus of claim 31, ~~wherein the first set of flexure~~
2 ~~linkages comprises at least two opposed symmetrical linkages, wherein the second set of~~
3 ~~flexure linkages comprises at least two opposed symmetrical linkages, and wherein the~~
4 ~~apparatus is~~ said first and second linkages are each configured to avoid minimize
5 kinematic singularities resulting from the symmetry.

36. (cancelled)

1 37. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a plurality of elongated members, and wherein the elongated~~
3 ~~members are flexibly coupled to form the linkages~~ wherein said first axis extends
4 transversely to said second axis.

1 38. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a plurality of elongated members and flexible joints~~
3 ~~coupling the elongated members together~~ wherein said first and second pairs of elongated
4 members are subjected to pre-loading.

1 39. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a~~ wherein said plurality of elongated members and flexible

3 ~~joints coupling the elongated members together, and wherein each of said flexible joint is~~
4 ~~configured~~ said first pair of elongated members is coupled to said first flexure joint to
5 ~~allow rotation of the~~ between said first pair of elongated members through at least a 20
6 degree range of motion.

1 40. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a~~ wherein said plurality first pair of elongated members and
3 ~~flexible joints coupling the elongated members together, and wherein each flexible is~~
4 coupled to said first flexure joint is configured to allow rotation of the between said first
5 pair of elongated members through at least a 40 degree range of motion.

1 41. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a plurality of elongated members and flexible joints~~
3 ~~coupling the elongated members together, and wherein the flexible joints contain no~~
4 ~~frictional contact~~ wherein said second pair of elongated members is coupled said second
5 flexure joint to allow rotation between said second pair of elongated members through at
6 least a 20 degree range of motion.

1 42. (currently amended) The apparatus of claim 31, ~~wherein the first and second sets~~
2 ~~of flexure linkages comprise a plurality of elongated members and flexible joints~~
3 ~~coupling the elongated members together, and wherein at least one of the joints further~~
4 ~~comprises a rolling contact joint~~ wherein said second pair of elongated members is
5 coupled to said second flexure joint to allow rotation between said second pair of
6 elongated members through a predetermined range of motion.

43. (cancelled)

44. (cancelled)

1 45. (original) The apparatus of claim 31, wherein the first motive device comprises a
2 magnetic linear servomotor.

1 46. (original) The apparatus of claim 31, wherein the second motive device
2 comprises a magnetic linear servomotor.

1 47. (original) The apparatus of claim 31, wherein the first and second motive devices
2 comprise magnetic linear servomotors.

1 48. (original) The apparatus of claim 31, wherein the holding member comprises a
2 wafer chuck.

1 49. (original) The apparatus of claim 31, wherein the holding member is configured
2 to hold a semiconductor substrate.

50. Claims 50-211 (cancelled).

1 212. (currently amended) An apparatus for positioning of an object in a plane, said
2 apparatus comprising:

3 a holding member retaining said object;

4 a ~~first set of flexure linkages~~ linkage coupled to the holding member, defining a
5 first joint thereat, with said first joint being coupled to ground through a plurality of
6 elongated members and a flexure joint; and

7 a motive device coupled to the holding member for moving the holding member,
8 with said plurality of elongated members being coupled to said flexure joint to move in
9 opposite directions to facilitate movement of said holding member along an axis in

10 response to movement of said holding member by said motive device ~~the first set of~~
11 ~~flexure linkages constraining the motion of the holding member to a substantially linear~~
12 ~~motion.~~

1 213. (currently amended) The apparatus of claim 212 ~~wherein the first set of flexure~~
2 ~~linkages constrains the motion of the holding member to said plane~~ further including an
3 additional linkage coupled to the holding member and including an additional plurality of
4 elongated members coupled to an additional flexure joint, with said additional plurality
5 of elongated members coupled to said additional flexure joint to move in opposite
6 directions to facilitate movement of said holding member along an additional axis.

1 214. (currently amended) The apparatus of claim 212 ~~wherein the first set of flexure~~
2 ~~linkages comprises at least two opposed symmetrical linkages~~ each of said plurality of
3 elongated members are of a common length.

1 215. (currently amended) The apparatus of claim 212 213 ~~wherein the first set of~~
2 ~~flexure linkages comprises at least two symmetrical flexure linkages, and wherein the~~
3 ~~apparatus is configured to avoid kinematic singularities resulting from the symmetry~~ said
4 axis extends transversely to said additional axis.

1 216. (currently amended) The apparatus of claim 212 213 ~~wherein each of the flexure~~
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~
3 ~~members together~~ said plurality of elongated members consists of a pair of elongated
4 members and said additional plurality of elongated members consists of an additional
5 pair of elongated members.

1 217. (currently amended) The apparatus of claim 212 216 ~~wherein each of the flexure~~
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~

3 ~~members together, and wherein each flexible joint~~ said linkage is configured to allow
4 rotation of the ~~between said pair of elongated members through at least a 20 degree range~~
5 of motion and said additional linkage is configured to allow rotation between said
6 additional pair of elongated members through at least a 20 degree range of motion.

1 218. (currently amended) The apparatus of claim 212 216 wherein each of the flexure
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~
3 ~~members together, and wherein each flexible joint~~ said linkage is configured to allow
4 rotation of the ~~between said pair of elongated members through a 40 degree range of~~
5 motion and said additional linkage is configured to allow rotation between said additional
6 pair of elongated members through at least a 40 degree range of motion.

1 219. (currently amended) The apparatus of claim 212 216 wherein each of the flexure
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~
3 ~~members together, and wherein the flexible joints have substantially no frictional contact~~
4 said pair of elongated members and said additional pair of elongated members are pre-
5 load.

1 220. (currently amended) The apparatus of claim 212 216 wherein each of the flexure
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~
3 ~~members together, wherein at least one of the joints further comprises a rolling contact~~
4 joint said linkage is configured to constrain the motion of said pair of elongated members
5 to rotate at substantially the same rate away from one another.

1 221. (currently amended) The apparatus of claim 212 220 wherein each of the flexure
2 ~~linkages comprise elongated members and flexible joints coupling the elongated~~
3 ~~members together, wherein at least one of the flexible joints further comprises a rolling~~
4 ~~contact joint coupling two of the elongated members, and wherein said rolling contact~~
5 joint said additional linkage is configured to constrain the motion of said ~~two~~ additional

6 pair of elongated members to rotate at substantially the same rate ~~and in opposite~~
7 ~~directions~~ away from one another.

222. (cancelled)

1 223. (previously presented) The apparatus of claim 212 wherein the motive device
2 comprises a magnetic linear servomotor.

1 224. (previously presented) The apparatus of claim 212 wherein the holding member
2 comprises a wafer chuck.

1 225. (previously presented) The apparatus of claim 212 wherein the holding member
2 is configured to hold a semiconductor wafer.

1 226. (currently amended) An apparatus for positioning an object in a plane, the
2 apparatus comprising:
3 a holding member configured to retain the object; and
4 a plurality of flexure linkages coupled to the holding member, defining a first
5 joint thereat coupled to a ground through a pair of elongated members and a rolling
6 contact joint, with said rolling contact joint and said pair of elongated members being
7 coupled ~~wherein the flexure linkages are configured to constrain movement of the~~
8 holding member within a predetermined range of motion, ~~with a ratio of a range of~~
9 ~~motion of the holding member to a characteristic length of the apparatus is greater than~~
10 0.05 by said pair of elongated members moving in opposite directions and at substantially
11 the same rate.

1 227. (currently amended) A system for forming a pattern on a substrate comprising:
2 a patterning device; and

3 a substrate positioning device, the substrate positioning device comprising:
4 a holding member configured to hold the substrate;
5 a first axis positioning system, wherein the first axis positioning system
6 comprises a first set of flexure linkages coupled to said holding member defining a first
7 set of first joints thereat, with each of said first joints of said set being connected to
8 ground through a first rolling contact joint and a first pair of elongated members, with
9 said first rolling contact joint and said first pair of elongated members being coupled to
10 the holding member, wherein the first set of flexure linkages is configured to constrain
11 movement of the holding member to a substantially linear motion along a first axis by
12 said first pair of elongated members moving in opposite directions and at substantially
13 the same rate; and
14 a second axis positioning system, wherein the second axis positioning system
15 comprises a second set of flexure linkages coupled to said holding member defining a
16 second set of second joints thereat, with each of the second joints of said second set being
17 connected to ground through a second rolling contact joint and a second pair of elongated
18 members, with said second rolling contact joint and said second pair of elongated
19 members being coupled to the holding member, wherein the second set of flexure
20 linkages is configured to constrain movement of the holding member to a substantially
21 linear motion along a second axis by said second pair of elongated members moving in
22 opposite directions and at substantially the same rate.